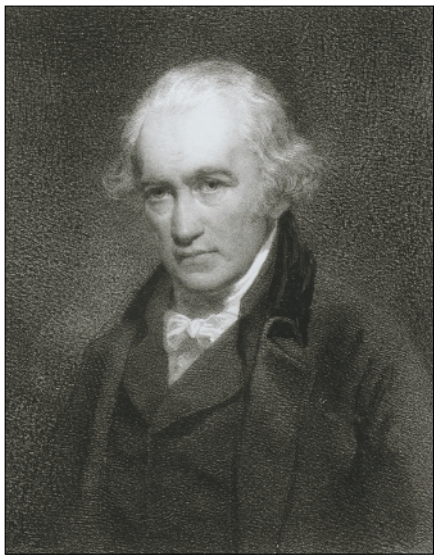
James Watt
Father of Mechanical Engineering (1736 - 1819)



James Watt was brought up in the engineering environment of his father's housebuilding and shipbuilding workshops in Scotland, which undoubtedly helped form his inquisitive nature. He lived in a dynamic era when invention tested and promoted the skills of workmen and the capacity of industry.

James was born in 1736, the youngest of five children, in Greenock, Scotland, approximately twenty-five miles from Glasgow. He was a frail child, but learned to become a skilled model maker and became familiar with nautical instruments in his father's workshops. The sciences attracted him, and he was an avid reader.

After his mother's death in 1753, he was sent to Glasgow to learn the craft of making mathematical instruments. That began an association with influential scientists and scholars that lasted throughout his life. A year in Glasgow and another year in London fed his appetite for experience in his field, but also impaired his health. After returning home to recover, he returned to Glasgow to become the university's mathematical-instrument maker. His unique skills as an engineer and a scientist were recognized, appreciated, and encouraged in this setting, and his business became prosperous.

Watt was challenged by anything he didn't understand and would always attempt to master its principles. His curiosity caused him to experiment with an early version of the steam engine, which ultimately sped the evolution of the Industrial Revolution. For nearly two thousand years, steam power was treated as merely a toy. It was a source of energy that was well ahead of the technology available to apply it. The first documented steam engine, developed by Papin in the late 1600s, was slow and clumsy and was rightfully called an atmospheric engine. With minor improvements, most notably by Newcomen, it was this type of engine that caught Watt's attention while he was at the University of Glasgow. The university's model of the Newcomen engine was in need of repair, and Watt was encouraged to work on it. In fact, he most likely encouraged the university to turn it over to him for repair in 1763. His approach to working on the engine reflected the pattern of experiment he would apply to all his projects for the rest of his life. His good friend, John Robison, once said of Watt, "He needed only to be prompted; everything became to him the beginning of a new and serious study, everything become science in his hands."

When he was finished, the model worked as perfectly as the full-sized engine, but only for a short time. Watt was intrigued. His evaluation of the differences between the model and the full-sized engine led him to a series of experiments on the nature of heat and the phenomenon of latent heat, discovered by Dr. Joseph Black, with whom he collaborated. It also led to the development of the first steam engine, where the power stroke was delivered by steam pressure, not atmospheric pressure.

Watt designed his "steam engine" in 1765. His dedication to perfection delayed the patent until 1769 and an acceptable (to him) engine until the mid-70s. Part of this delay must be attributed to the lack of workmen's skills and industrial processes. However, Watt repeatedly reworked the engine as the skills and processes improved. These delays tormented friends and drove investors to the brink of ruin. It was another ten years before the engine had proved itself in application so that Watt and his investors could reap the benefits of his invention.

During this time, Watt devoted his time to perfecting his creation, augmenting his income (which expanded his reputation as scientist, engineer, and

inventor), and fighting chronic health problems. The improvements he made to the steam engine, though, were only for the narrow market of the mining industry. He rejected rotary motion. Watt was unable to see how his invention, benefitted by the science of mechanical engineering that he fathered, could be applied to the other industries, such as cotton and textile, that were developing.

Matthew Boulton, the greatest industrial organizer of the 18th century, became Watt's partner in 1774. This relationship proved successful for both men and machine. The path was not straight and smooth, though. Watt's lack of business acumen and his perfectionist attitude were often a source of irritation to those around him.

For many years, Watt refused to work on the development of a rotary engine until his associates challenged him. By 1786, the double-acting rotary engine was a proven success and would constitute the majority of the firm's production. Watt's other inventions include a copying machine, which chemically copied writing, a linen-drying machine, a waterproofing process, and a device to measure specific gravity. His more scientific pursuits revolved around his membership in the Lunar Society of Birmingham. He was very much the center of this group of brilliant scientists and philosophers, which included Joseph Priestly, Erasmus Darwin (the grandfather of Charles Darwin), William Frederic Wilhelm Herschel (the astronomer), and Josiah Wedgewood.

As the century and Watt's patent on the steam engine drew to a close, Watt quietly closed the tumultuous chapter on his development of the steam engine. He now would enjoy remarkably good health and bask in the recognition of scientists and engineers throughout the world. He continued to invent until his death in 1819. A final tribute occurred in 1882 when the unit of power was designated the watt, to honor this mastermind of mechanical science.

References

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